

MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
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Gaithersburg, Maryland 20899-2320

SRM Number: 1623c
MSDS Number: 1623c
SRM Name: Sulfur in Residual Fuel Oil
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SECTION I. MATERIAL IDENTIFICATION

Material Name: Sulfur in Residual Fuel Oil

Description: This Standard Reference Material (SRM) is intended for use in the calibration of instruments and the evaluation of methods used in the determination of total sulfur in fuel oils or materials of similar matrix. A unit consists of 100 mL of commercial "No. 4 (light)" residual fuel oil in an amber bottle.

Other Designations: Sulfur (brimstone, sulphur) in Fuel Oil No. 4.

Name	Chemical Formula	CAS Registry Number
Sulfur in Residual Fuel Oil	complex oil mixture	68476-31-3

DOT Classification: Fuel oil; UN1202; Hazard Class 3; Packing Group III

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Component	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Residual Fuel Oil No. 4	100	OSHA TWA: 5 mg/m ³ (mineral oil mist)
		ACGIH TWA: 5 mg/m ³ (mineral oil mist)
		ACGIH STEL: 10 mg/m ³ (mineral oil mist)
		OSHA TWA: 0.2 mg/m ³ (coal tar pitch volatiles))
		NIOSH Ceiling (10 min): 15 mg/m ³ (hydrogen sulfide)

NOTE: This material contains a nominal sulfur concentration of 0.4 % and may release hydrogen sulfide.

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Residual Fuel Oil No. 4	
Appearance and Odor: dark liquid, petroleum odor	Kinematic Viscosity (@ 40 °C): $5 \times 10^{-6} \text{ m}^2/\text{s}$ (5 cSt)
Density (g/cm³): 0.9 @ 15 °C	Vapor Density (air =1): > 1
Boiling Point (°C): > 101	Heat of Combustion: 43.98 MJ/kg (18 907 Btu/lb)
Pour Point (°C) : 21	Water Solubility: immiscible

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Autoignition Temperature: 263 °C

Flammability Limits in Air (Volume %): **UPPER:** 5
LOWER: 1

Extinguishing Media: Use a dry chemical powder, carbon dioxide, or foam. Use a water spray to cool fire exposed containers only. **DO NOT** use a forced water stream directly into an oil fire as this will only scatter the fire; use a smothering technique for extinguishing the fire of this combustible material.

Unusual Fire and Explosion Hazards: Moderate fire hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive above flash point.

Special Fire Procedures: Fuel Oil No. 4 is an OSHA Class IIIA combustible liquid. Firefighters should wear self-contained breathing apparatus (SCBA) and full protective clothing.

SECTION V. REACTIVITY DATA

Stability: X Stable Unstable

Stable at normal temperatures and pressure.

Conditions to Avoid: Avoid heat, flames, and other sources of ignition. Containers may rupture or explode if exposed to heat. Dangerous gases may accumulate in confined spaces.

Incompatibility (Materials to Avoid): This material is a fire and explosion hazard when exposed to strong oxidizing agents.

Hazardous Decomposition or Byproducts: Hydrogen sulfide may be released when heated. Thermal decomposition may also produce oxides of sulfide and carbon. See Section IV: “Fire and Explosion Hazard Data”.

Hazardous Polymerization: **Will Occur** X **Will Not Occur**

SECTION VI. HEALTH HAZARD DATA

Route of Entry: X Inhalation X Skin X Ingestion

Effects of Overexposure (ACUTE):

Skin: Prolonged or widespread skin contact with fuel oils may result in defatting of the skin with drying, cracking, and possible blisters.

Eyes: May cause minimal irritation, experienced as temporary discomfort.

Inhalation: The inhalation hazard is low unless heated or misted. High concentrations of vapor or mist of fuel oils may cause irritation and possibly symptoms of central nervous system depression.

Ingestion: Ingestion of fuel oils may cause gastrointestinal irritation, nausea, vomiting, cramping and diarrhea. Aspiration during ingestion or vomiting may result in pulmonary irritation, coughing, gagging, difficulty breathing, substernal distress, and pulmonary edema.

Listed as a Carcinogen/Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens		<u> X </u>
In the International Agency for Research on Cancer (IARC) Monographs	<u> X </u>	
By the Occupational Safety and Health Administration (OSHA)		<u> X </u>

EMERGENCY AND FIRST AID PROCEDURES:

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Thoroughly clean and dry contaminated clothing and shoes before reuse. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 min. Obtain immediate medical assistance.

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration by qualified personnel. Get immediate medical attention.

Ingestion: Get immediate medical attention.

NOTE to Physician: For ingestion, consider gastric lavage.

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material Is Released: Avoid heat, flames, sparks and other sources of ignition. Spills can be contained by non-combustible absorbents, such as activated carbon, and sand. Collect spilled material in appropriate container for proper disposal. Clean up spills promptly to reduce fire or vapor hazards. Personnel performing the clean-up should use protection against contact with the liquid and vapor or mist inhalation.

Waste Disposal: Follow all federal, state and local laws governing disposal. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

Handling and Storage: Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances. Provide adequate ventilation where operating conditions (heating and spraying) may create excessive vapors and mists. Provide approved respiratory apparatus for non-routine or emergency use. Use an approved filter and vapor respirator when vapor or mist concentrations are high. Wear protective chemical resistant gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and drench shower should be readily available near the handling and use areas. Wash exposed skin areas thoroughly after

handling this material. Do not smoke in areas of use. After use, the bottle should be tightly capped and stored under normal laboratory conditions away from direct sunlight.

NOTE: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store material in closed containers in a cool, dry, well ventilated area away from sources of heat, sparks, open flames, and oxidizing agents. Protect containers from physical damage.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc., MSDS *Fuel Oil No. 4*, 18 September 2003.
SRM 1693c; *Sulfur in Residual Fuel Oil*; Natl. Inst. Stand. Technol.; U.S. Department of Commerce: Gaithersburg, MD (April 2004).

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.